HOW EASY IS IT TO READ TINNITUS-RELATED WEBPAGES IN JAPANESE

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Abstract

Purpose: To assess the readability of online tinnitus-related information in the Japanese language. This thesis also aimed to assess the quality of this information using the Health on the Net Foundation Code of Conduct (HONcode) certification.

Method: Websites were selected by entering 5 key search terms, identified by native Japanese speakers, into the Japanese ccTLD (country code top-level domain) versions of two search engines: Google (google.co.jp) and Yahoo! (yahoo.co.jp). The first 10 webpages generated by each search term were matched against the inclusion and exclusion criteria, producing 23 unique webpages once duplicates were removed. Webpage information, such as the type of organisation, the location of the webpage host, and the presence or lack of HONcode certification, were recorded. Part 1 of this study assessed the webpages' readability using the jReadability formula. Part 2 assessed the quality of these webpages.

Results: Only two of the 23 webpages had a jReadability level below the recommended Upper-intermediate level. The webpages had a mean readability score of 2.48 or Lower-advanced, suggesting that readers require eight years of education to read and understand this material. Webpage quality could not be assessed as only one website held HONcode certification.

Conclusion: The results of this study indicate that the vast majority of online tinnitus-related information in Japanese is written at significantly higher readability levels than the recommended sixth grade reading level. This suggests that online tinnitus-related information in Japanese is generally difficult to read and is therefore inaccessible to the average reader. For this reason, audiologists and medical

professionals must be made aware of the health literacy issues faced by the general population when recommending or supplying healthcare information.

Table of Contents

List of Tables

List of Abbreviations

AAO-HNS = American Academy of Otolaryngology-Head and Neck Surgery Foundation

CBT = Cognitive Behavioural Therapy

ccTLD = country-code Top-Level Domain

ENT = Ear, Nose, and Throat

HON = Health on the Net

HONcode = Health on the Net Foundation Code of Conduct

IOM = Institute of Medicine

JLPT = Japanese-Language Proficiency Test

jReadability = Japanese Text Readability Measurement System

NICE = National Institute for Health and Care Excellence

NIHL = Noise-Induced Hearing Loss

ORLJ = Oto-Rhino-Laryngological Society of Japan

PCC = Patient-Centred Care

RGL = Reading Grade Level

SAM = Suitability Assessment of Materials

SDM = Shared Decision Making

SNHL = Sensorineural Hearing Loss

SSD = Single-Sided Deafness

TRT = Tinnitus Retraining Therapy

URL = Uniform Resource Locator

US = United States

WHO = World Health Organization

Chapter 1: Introduction

1.1 Study Overview

Tinnitus is described as the perception of sound in the absence of external auditory stimuli (Henry, Dennis, & Schechter, 2005) and is commonly associated with risk factors such as hearing loss and other otological diseases (Baguley et al., 2013). Hearing loss affects approximately 466 million people globally and is the fourth leading cause of disability worldwide (World Health Organisation, 2018). Because tinnitus and hearing loss are closely linked, populations with a higher prevalence of hearing loss also have a greater prevalence of tinnitus (Savastano, 2008).

Tinnitus can cause difficulty understanding speech (Stouffer & Tyler, 1990), increase depression and anxiety (Lockwood et al., 2002), and interfere with adequate sleep and concentration (Heller, 2003). There is currently no gold standard established in tinnitus management (Tunkel et al., 2014); however, several guidelines exist to guide clinicians in their clinical decisions surrounding tinnitus treatment. It is therefore vital that patients with tinnitus and their communication partners (such as family members) have access to high-quality information to understand the underlying causes of tinnitus and the available treatment options.

The internet has become a popular source to find health information (Morahan-Martin, 2004; Tan & Goonawardene, 2017) for medical professionals and consumers alike. The internet makes it easier for patients to access a broader range of health information online (Rice, 2006), influencing the process health consumers make when making health-based decisions (Dutta-Bergman, 2004). Readability and accuracy of such information is highly contended (Gilmour, 2007), which raises concerns about

the quality of online health information encountered by consumers (Diviani et al., 2015).

Past and current research suggest that online health information is often written at levels beyond what the average reader can comprehend (Andrus & Roth, 2002; Mcinnes & Haglund, 2011; Storino et al., 2016). The quality of online health information also varies greatly (Boyer & Dolamic, 2015). There is a large body of research that highlights the disparity between patient health literacy and the readability of online information related to hearing in the English language (Andrus & Roth, 2002; Laplante-Lévesque et al., 2012). In contrast, there are currently no studies concerning the readability and quality of tinnitus-related information in the Japanese language.

This chapter reviews current and past literature related to the readability and quality of tinnitus-related health information found on the internet in the Japanese language. Relevant health conditions such as hearing loss and tinnitus will be explained within the context of health literacy and access to information. Important healthcare models such as patient-centred care (PCC) and shared decision making (SDM) are also reviewed. Readability formulas such as the Japanese Text Readability Measurement System (jReadability) and quality tools such as the HONcode are evaluated. The aims and hypotheses of the present study are outlined at the end of this chapter.

1.2. Rationale

Tinnitus is a prevalent health symptom associated with sundry consequences concerning quality of life (Adjamian et al., 2009; Ferreira et al., 2009). Accessing reliable and quality health information is a crucial component in understanding health

conditions and available treatment options. With the rapid expansion of the internet, giving rise to an information revolution (Jadad & Gagliardi, 1998), the internet has become a favoured source of health information for consumers (Berland et al., 2001). The efficacy and benefit of seeking health information online depend on factors such as the quality, credibility, and readability of this information (Morahan-Martin, 2004). Polishchuk et al. (2012) explain that readability levels should not exceed sixth grade reading level for health information to be understandable.

A study conducted by Alexander (2018) investigated the readability of online hearing-related information in Japanese. The results of this study revealed that hearing-related health information in Japanese is generally difficult to read, with mean readability scores exceeding the recommended sixth grade reading level (Alexander, 2018). Similar studies in English and Spanish indicate that health information is often written at levels that far surpass their intended audience (Greer, 2019; Okuhara et al., 2017). There are approximately 127 million people in the world who speak Japanese, making it the ninth-largest language in the world (Iwasaki, 2013). Despite this, there is currently minimal research aimed at investigating the readability of Japanese health information, let alone any consensus concerning general readability in the Japanese language (Sakai, 2013). As a result, literature on Japanese readability scores that relates to tinnitus information has yet to be published. This study will address this gap in the literature and the limitations surrounding tinnitus-related health information found on the internet by assessing the readability and quality of tinnitus-related information in Japanese.

1.3. Hearing Loss

The most common cause of tinnitus is considered to be hearing loss, specifically noise-induced hearing loss (NIHL) (Crummer & Hassan, 2004; Han et al., 2009.) Hearing loss, also known as hearing impairment, is believed to be one of the most common disabilities in the human population (Ohlenforst et al., 2017). Hearing loss affects over 5% of the world's population and a third of persons over the age of 65 (World Health Organisation, 2020). Hearing loss can be acquired or congenital in nature (or a combination of both). Individuals may experience early-onset hearing loss during childhood or conductive hearing loss following bouts of chronic middle ear infections (Eggermont, 2017). Others may experience age-related hearing loss (presbycusis), NIHL, or sensorineural hearing loss (SNHL) after consuming ototoxic medication (World Health Organisation, 2020).

As life expectancy increases worldwide, the prevalence of hearing loss and tinnitus is also likely to increase (Ciorba et al., 2012). The effects of hearing loss present significant risks to individuals functioning in everyday life (Vas et al., 2016). Consequences such as impaired speech intelligibility, both in quiet contexts and where there is background noise, and reduced language acquisition can negatively impact quality of life (Ohlenforst et al., 2017). Ishi et al. (2016) reported that approximately 11% of Japan's total population experience hearing loss.

1.4. Tinnitus

The term *tinnitus* is defined as the conscious perception of sound in the absence of external acoustic stimuli (Bauer, 2018). Derived from the Latin word *tinnire*, to ring, this phenomenon is often described as a ringing sensation perceived inside or outside the head (Baguley et al., 2013; Bauer, 2018). More common manifestations

include humming, ringing, whistling, roaring, or cicada-like sounds (Bauer, 2018). These sounds can be unilateral or bilateral and may be pulsatile or intermittent in quality (Langguth et al., 2013).

Tinnitus is not a disease, in and of itself, but rather it is a symptom with a diverse range of causes and co-factors (Tunkel et al., 2014). It can occur in isolation as an idiopathic symptom, or tandem with specific auditory and non-auditory organic conditions (Savage & Waddell, 2014). In most cases, the onset is insidious (Baguley et al., 2013). Tinnitus can arise at any time due to pathological changes along the length of the auditory pathway (Langguth et al., 2013). The auditory percept typically develops as a consequence of initial cochlear lesions such as presbycusis, NIHL, and sudden hearing loss; all of which are variations of SNHL (Langguth et al., 2013). In rare cases, tinnitus is linked to serious diseases such as vascular tumours or vestibular schwannomas (Tunkel et al., 2014).

Tinnitus is also reported in other auditory disorders such as cerumen impaction in the ear canals, administration of ototoxic drugs, prolonged noise exposure, and noise trauma (Adjamian et al., 2009). In middle ear pathologies, tinnitus is a transient symptom that accompanies otosclerosis, otitis media, and eustachian tube dysfunction (Tunkel et al., 2014). Unilateral, low-frequency tinnitus is a distinct feature of cochlear abnormalities such as Ménière's disease (Havia et al., 2002). Non-auditory conditions, in contrast, can range from vascular anomalies and intracranial hypertension (Tunkel et al., 2014) to diabetes and autoimmune disorders (Savastano, 2008), as well as illnesses, injuries, and infections of the head and neck (Adjamian et al., 2009).

1.4.1. Worldwide Prevalence

There is a lack of consensus surrounding the prevalence of tinnitus globally. International studies suggest that it is difficult to estimate the prevalence of tinnitus for the global population, as well as subdivisions by sex and age (Wu et al., 2015). This is due to several factors, such as ambiguity in defining the condition and whether questions used during epidemiological data collection support appropriate wording (McCormack et al., 2016; Wu et al., 2015). Despite these limitations, population surveys estimate that 10 - 15% of adults in the general population experience tinnitus (Henry, Dennis, & Schechter, 2005) while 30 - 35% of elderly persons experience persistent tinnitus (Ferreira et al., 2009). Tunkel et al. (2014) state that 1 in 5 adults find it to be a serious burdening problem and seek clinical intervention. Of those who experience tinnitus, 6% find their symptoms to be incapacitating (Heller, 2003). The prevalence of persistent tinnitus increases with age and peaks during the seventh decade of one's life (Bauer, 2018). However, it is not restricted to elderly populations and has manifested among younger age populations, presumably due to increased recreational noise exposure at damaging levels (Bauer, 2018).

1.4.2. Prevalence in Japan

There are currently no national statistics surrounding the prevalence of tinnitus in Japan. There are several studies, however, aimed at investigating the prevalence of tinnitus in older Japanese populations. In a prospective study involving community-dwelling adults (aged 45 to 79 years) in Japan, 11.9% of participants reported having tinnitus, with 0.4% of the overall population experiencing debilitating effects from severe tinnitus; this trend increased with age in both sexes (Fujii et al., 2011). In another community-based study of Japanese elders (aged 65 years and older), 15.5% of participants reported having mild tinnitus, 3% with severe tinnitus and 18.6% with

mild to severe tinnitus (Michikawa et al., 2010). The results from these studies are consistent with the worldwide prevalence of tinnitus in adults (10 - 15%) and elderly populations (30 - 35%).

1.4.3. Impact

Tinnitus is a widespread and potentially distressing disorder (McKenna et al., 2014). The effects of tinnitus related to mental and physical health are extensive (Henry, Dennis, & Schechter, 2005). Tinnitus not only burdens the individual experiencing the sensation but produces an array of negative consequences that can substantially impair quality of life (Ferreira et al., 2009; Langguth et al., 2013). In most cases, patients report experiencing mild tinnitus; however, some experience persistent and chronic tinnitus (Tunkel et al., 2014). Pinto et al. (2010) explained that the degree of hearing loss does not determine the level of distress caused by tinnitus. Instead, an intricate network of "psychological, psychosocial, environmental factors and personality traits" influence the severity of tinnitus perceived and its impact on quality of life (Adjamian et al., 2009, p. 15).

Patients who experience tinnitus are often subject to a myriad of ramifications (Tunkel et al., 2014). Many patients report an overall decrease in sleep, concentration, and cognitive functioning necessary for day-to-day living (Piccirillo et al., 2020). Behavioural changes such as irritability and insomnia are often linked to depression (Ferreira et al., 2009). Structural changes to the auditory system are associated with impaired speech understanding (Humes, 1996) and concentration (Sullivan, 1993) following hearing loss and hyperacusis (Bauer, 2018). When compounded, these consequences can disrupt one's personal and professional life in the form of acute lifestyle changes (Tunkel et al., 2014).

The World Health Organisation (WHO) described the effects of chronic tinnitus as debilitating and stress-inducing (World Health Organisation, 2015). Cross-sectional studies found that tinnitus patients are more likely to develop anxiety disorders and symptoms associated with depression (Bauer, 2018). Because anxiety and depression are key measures of psychological distress, they play a critical role in reducing the health-related facets of quality of life (Bartels et al., 2008). This, in turn, establishes a vicious cycle between quality of life and psychological distress (Bartels et al., 2008). In some cases, co-occurring auditory disorders such as phonophobia and hyperacusis are indicative of an anxiety disorder (Langguth et al., 2013). Within a socioeconomic framework, patients who experience tinnitus are more at risk of receiving a disability pension (Ferreira et al., 2009). In elderly populations, tinnitus is believed to produce poor emotional balance and social withdrawal (Negrila-Mezei et al., 2011).

1.5. Management of Tinnitus

With rare exceptions, tinnitus cannot be cured using conventional medical treatment (Dobie, 1999). Although various treatment options exist, Tunkel et al. (2014) suggest that there are currently "no evidence-based, multidisciplinary clinical practice guidelines to assist clinicians with management" (p. 1). As a result, tinnitus patients are often disadvantaged when seeking clinical intervention (Henry, Zaugg, & Schechter, 2005). Instead, tinnitus intervention aims to reduce the presence of tinnitus experienced and its impacts on daily life while keeping adverse treatment effects minimal (Savage & Waddell, 2014). Comprehensive treatment and management pathways depend on several factors such as audiological assessment (presence, type, severity, and symmetry of hearing loss), medical history, and psychological

evaluation. In most cases, an integrated multidisciplinary approach is required following diagnosis.

Current tinnitus management options include sound therapy such as hearing aids and sound generators (Hall & Hoare, 2010; Ogawa et al., 2020), cochlear implants (Baguley & Atlas, 2007), educational counselling, tinnitus retraining therapy (TRT), and cognitive behavioural therapy (CBT) (Ogawa et al., 2020). Evidence surrounding treatment efficacy, however, vary. This is partly due to the disorder's heterogeneous nature (Langguth et al., 2013), followed by factors such as difficulties faced during tinnitus assessment, significant placebo effects, and the use of low-quality methodologies during treatment trials (Shore et al., 2016). In a systematic review and meta-analysis of studies exploring the effects of cochlear implants on tinnitus perception, Borges et al. (2020) found that all the patients in these studies showcased improvements in their tinnitus perception scores by over 50%. Similar findings were also published by Levy et al. (2020) for patients with single-sided deafness (SSD) where most patients displayed significant score reductions in their tinnitus-related patient-reported outcome measures. An updated Cochrane Review by Hobson et al. (2012) and clinical practice guideline by the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNS) (Tunkel et al., 2014) determined that CBT held the strongest evidence base within the scope of tinnitus management (Nagaraj & Prabhu, 2019; Ogawa et al., 2020). Other treatment strategies such as educational counselling and hearing aids had strong- to moderate-level evidence (Ogawa et al., 2020). On the contrary, Ogawa et al. (2020) found that no studies provided high-level evidence to support the efficacy of pharmacotherapy and sound therapy approaches such as sound generators. Furthermore, although effective, TRT was recommended but had low-level evidence.

Because there is no gold standard established in tinnitus management, it is difficult for tinnitus patients to make informed decisions surrounding appropriate treatment options (Henry, Dennis, & Schechter, 2005). Even so, several guidelines exist to guide clinicians in their clinical decisions surrounding tinnitus management. The guideline published by the National Institute for Health and Care Excellence (NICE) endorses SDM and PCC at all stages of care, and focuses heavily on education and counselling (National Institute for Health and Care Excellence, 2020). For tinnitus patients who experience impaired communication due to hearing loss, the NICE guideline recommends offering amplification devices whereas psychotherapy, such as CBT, is recommended to manage tinnitus-related distress (National Institute for Health and Care Excellence, 2020). This is also seen in the clinical practice guideline for chronic tinnitus diagnosis and treatment published by the Oto-Rhino-Laryngological Society of Japan (ORLJ) where educational counselling and CBT are strongly recommended. This because both treatments have a moderate- to strong-evidence base while hearing aids are strongly recommended for tinnitus patients with hearing loss. This is further corroborated by tinnitus guidelines previously published in Denmark, Germany, Sweden, the Netherlands, and the US, as systematically reviewed by Fuller et al. (2017), where all recommend implementing education and counselling as an essential part of tinnitus management. This is also supported by the multi-disciplinary European guideline for tinnitus published by Cima et al. (2019).

Counselling should comprise important processes such as education, SDM, and PCC. This ensures that patients are empowered when provided with information and advice. Educating patients helps them to better understand their condition while, at the same time, addressing false assumptions associated with the disorder (Bartels et al., 2008). As a result, SDM and PCC are critical components of tinnitus management so

that patients are well-informed, can make realistic goals surrounding different treatment interventions, and are likely to comply with treatment strategies.

1.6. Patient-Centred Care and Shared Decision Making

The Institute of Medicine (IOM) described PCC as one of its six objectives proposed to improve global health care within the 21st Century (Rathert et al., 2012). PCC is a multifaceted concept designed to elicit the needs, values, and preferences of individual patients (Rathert et al., 2012). Once these needs are expressed, they should guide all clinical decisions in supporting an individual's health and life goals (Applegate et al., 2018; Berghout et al., 2015). PCC aims to provide care that is not only compassionate and empathetic, but is also evidence-based, "safe, effective, timely, efficient and equitable" (Berghout et al., 2015, p. 1). Barry and Edgman-Levitan (2012) describe the pinnacle of PCC as the active engagement of patients in the clinical decision-making process. Ear, Nose, and Throat (ENT) patients, such as tinnitus patients, commonly refer to the internet to research their health condition prior to attending an appointment (McKearney et al., 2018). In some cases, they use this information to influence their management decisions (McKearney et al., 2018). As a result, some authors highlight patient view, as in the case of the SDM process, as a critical component of integrated management in lieu of poor evidence-based practice (Aazh et al., 2016).

The SDM process strives to promote patient autonomy concerning treatment decisions while ensuring patient preferences are reflected at every stage (Rodenburg-Vandenbussche et al., 2015). SDM is a crucial component of quality care and should be offered as a basic part of good clinical practice (Rodenburg-Vandenbussche et al., 2015). As a minimum, the SDM process involves two parties: the clinician and the

patient (Barry & Edgman-Levitan, 2012). Other parties, such as healthcare team members and communication partners, including family members and friends, may also be invited to participate (Barry & Edgman-Levitan, 2012). During the SDM process, clinicians and patients exchange and discuss information such as the available healthcare options, the associated risks and benefits, relevant research, and available evidence in partnership with the patients' values and preferences (Barry & Edgman-Levitan, 2012; Elwyn et al., 2014). This allows patients to better understand the relevant factors while undertaking a mutual sense of responsibility during the decision-making process (Barry & Edgman-Levitan, 2012). Because there are multiple treatment strategies available within tinnitus management, SDM encourages patients to explore their views and opinions within the context of their treatment options and management approaches from their own patient perspective (Elwyn et al., 2014).

PCC has been linked to lowered healthcare resource needs and costs (Berghout et al., 2015), and improved understanding between patients and clinicians by delivering patient-centred communication (Tzelepis et al., 2015). Inviting patients to actively participate in their care has been positively associated with congruous decision-making apropos of treatment plans, increased health outcomes, and overall patient satisfaction. This also includes patient wellbeing and quality of life (Berghout et al., 2015; Calisi et al., 2016). Increasing evidence suggests that collaborative care improves the quality of care received and produces better healthcare outcomes for elderly patients who experience multiple chronic conditions (Van der Eijk et al., 2013). These findings are particularly significant within hearing healthcare as most tinnitus patients are elderly and may experience chronic tinnitus. Clinicians have also reported an overall improvement in job satisfaction (Van der Eijk et al., 2013).

Tzelepis et al. (2015) explained that only patients can affirm whether appropriate levels of information and communication have been given, emphasising the importance of using patient-reported measures to properly reflect and assess the quality of information being delivered. On this basis, a lack of PCC and SDM has been shown to generate discrepancies between clinician perspectives and patient views regarding the quality of care delivered and whether this aligns with the patient's values, preferences, and needs (Tzelepis et al., 2015).

One of the most important determinants of PCC is considered to be health literacy. Although both PCC and SDM encourage patient involvement, low health literacy can limit patient understanding when consuming complex information around treatment options and this then prevents them from fully participating in the clinical decision-making process (Kim et al., 2001). This is because patients require the ability to process and manage health-related information when accessing healthcare resources (Yin et al., 2012). As a result, previous studies highlight the difficulty faced by clinicians when trying to communicate effectively with and involve populations with low health literacy in the SDM process (Altin & Stock, 2016).

1.7. Health Literacy

The WHO defines health literacy as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" (World Health Organisation, 2010, para. 2). Health literacy is not limited to a single skill or attribute such as health-related reading or numerical competence (Jessup et al., 2017). Instead, health literacy involves a range of functional, interactive, critical, and numeracy skills (Al Sayah et al., 2012). Functional, interactive, and numeracy skills are needed to

interpret and communicate effectively about health-related information while critical skills are required to navigate the healthcare system and make appropriate health-based decisions (Al Sayah et al., 2012; Kutcher et al., 2016).

Health literacy has been shown to play a critical role in the context of health information seeking (Diviani et al., 2015). Good health literacy enables individuals to access and understand health information (Jessup et al., 2017). It also empowers them to seek the proper support they require when managing unexpected illnesses or existing chronic conditions (Jessup et al., 2017). However, misunderstanding health information can lead to adverse health consequences alongside breakdowns in communication and clinician-patient rapport (Britten, 2000). As a result, inadequate health literacy is an independent risk factor for poor health outcomes (Volandes & Paasche-Orlow, 2007) in tandem with decreased comprehension and knowledge surrounding medical care, health conditions, and health information (Andrus & Roth, 2002).

Several studies yield consistent findings where lower health literacy scores (measured as an individual's reading ability and numeracy skills) are associated with increased hospitalisations, higher mortality rates, and impaired capacities to self-care (Beauchamp et al., 2015). Unsurprisingly, low health literacy is related to low literacy. In many cases, low literacy in a population is directly related to a range of poor health outcomes (Nutbeam, 2008). Data received from multiple developed nations demonstrate a positive trend between low literacy levels and reduced consumption of available health information and services (Nutbeam, 2008). The consequences of low health literacy range from increased patient burden and reduced efficacy during treatment and management activities (Beauchamp et al., 2015) to

poorer self-reported health (Andrus & Roth, 2002), increased health care costs, feelings of embarrassment, and lack of confidence (Kutcher et al., 2016).

Current research into health literacy suggests that online health information is often written at much higher reading levels than the average person can understand (Stableford & Mettger, 2007). A growing body of literature assessing the readability of health education materials found that reading levels hugely exceed the reading comprehension of the demographic they were developed for (Davis et al., 1990; Stossel et al., 2012). In a comparative study, Nakayama et al. (2015) found that health literacy in the Japanese population was generally lower than that in Europe.

In a pilot study, aimed at improving health literacy in a Japanese community population, Ishikawa et al. (2018) revealed that the health literacy scores of the participants (both male and female, and relatively well-educated) used in this study were lower than that of Japanese male office workers (all of whom had university degrees). Furthermore, a Japanese study conducted by Suka et al. (2015) found that individuals with higher health literacy levels were much more likely to obtain adequate health information across multiple sources. They were also less likely to develop harmful habits such as smoking, regular drinking, and exercise deficiency and, in turn, fostered individuals to report their health as being good (Suka et al., 2015).

Improving health literacy and subsequent patient-centred outcomes can be achieved through several means. These include tailoring clinical conversations, utilising educational materials, as well as improving patient education levels and patient education interventions. For example, tailoring conversations to discuss the benefits and risks of tests and treatment strategies has increased health literacy (Slatore et al., 2016). In contrast, implementing educational materials in addition to

improving education levels and patient education interventions have been linked to better overall health outcomes (Slatore et al., 2016). Improving factors such as clinician sensitivity and health service structures have also been shown to ameliorate difficulties surrounding access to health care services and quality of clinician-patient communication (Nutbeam, 2015). When compounded, these improvements place clinicians in a better position to offer patient education suited to the individual's needs and capabilities (Nutbeam, 2008). They also increase important facets such as knowledge, motivation, and self-confidence along with adherence to recommended clinical care (Miller, 2016). This leads to improved health care outcomes in association with successfully implemented clinical care (Miller, 2016; Nutbeam, 2000). Better health outcomes can also be achieved by encouraging families to model positive health practices (Barnes et al., 2020), increasing self-efficacy (Grembowski et al., 1993), reducing stress (Avey et al., 2003), and increasing cultural competency amongst clinicians (Kagawa-Singer & Kassim-Lakha, 2003). The benefits of improved health literacy influence the entire scope of one's life activities in a personal (home), social (Nutbeam, 2000), cultural (Levin-Zamir et al., 2017), academic, and economic sense (McDaid, 2016). As a result, advancements in health literacy will, in turn, allow for the progression of greater patient autonomy (Bastian, 2008) and personal empowerment (Nutbeam, 1998). Several studies aimed at investigating the relationship between health literacy and quality of life found a positive correlation between two, albeit of varying degrees (Ehmann et al., 2020; Jayasinghe et al., 2016; Zheng et al., 2018). In a population, higher levels of health literacy may foster increased social benefits such as increased equity and sustainability of changes in public health (Sørensen et al., 2012), along with effective social movements within communities related to health and the development of social capital (Nutbeam, 2000).

To achieve an improvement in health literacy entails much more than simply transmitting information (Nutbeam, 2000) and applying basic reading and numeracy skills within the context of health care (Berkman et al., 2010). Improvements in health literacy can be measured according factors such as the acquisition of basic literacy skills (Paasche-Orlow et al., 2005) and improved knowledge surrounding the determinants of health (Ishikawa et al., 2018) in support of greater patient autonomy during health-based decision-making (Nutbeam, 2000). This knowledge and related skills can be acquired through several avenues such as formal education (Ishikawa et al., 2018) or patient education materials designed to meet individual needs (Nutbeam, 2000). This is because most patients, regardless of literacy level, prefer materials that are not only simple but easy-to-read (Andrus & Roth, 2002). Nutbeam (2015), however, highlights that with any form of education, significant differences found within educational methods, media, and content will produce different learning outcomes and corresponding health outcomes. As a result, health information and an individual's access to health information (and their improved capacity to effectively utilise it) play a critical role in improving health literacy and feelings of empowerment and independence (Nutbeam, 2000). The provision of appropriate levels of health information better equips the general population to overcome the structural barriers of health. Appropriate reading grade levels in light of improved health literacy have shown to lower cognitive load and improve decision making due to increased motivation, understanding, and implementation of health information (Hibbard & Peters, 2003).

1.8. Access to Online Health Information and the Role of the Internet

Health information can be found online and offline. This includes but is not limited to traditional sources of information such as health professionals, family members and friends, traditional media such as television, newspapers and magazines, and increasingly online on the internet (Dobransky & Hargittai, 2012). A survey conducted by the Ministry of Internal Affairs and Communications in Japan in 2015 revealed that approximately 80% of users sought health information on the internet, regardless of gender or age (Taira et al., 2020). In Japan, a 2007 national survey showed that 69% of Japanese people had used the internet within the past year (Takahashi et al., 2011). Cline (2001) suggests that health professionals and consumers are increasingly looking to the internet as a source of interactive health communication. Consumers access online health information via three main pathways: directly searching for health information, "participating in support groups and consulting with health professionals" (Cline, 2001, p. 673). In some cases, the internet is used in place of formal medical consultations, particularly among patients with financial limitations (Storino et al., 2016).

Drobransky and Hargittai (2012) state that access to quality health information is a significant resource that influences health in modern Western society. Data collected from four national surveys conducted in the US (Health Information National Trends Survey by the National Cancer Institute) and Europe (eHealth Consumer Trends Survey funded by the European Commission) support this statement (Takahashi et al., 2011). The prevalence of internet use for health care purposes in the US was approximately 20% in 2001 and 40% in 2003 (Baker et al., 2003). The prevalence in Europe was approximately 42% in 2005 and 47% in 2007 (Kummervold et al., 2008). However, a cross-sectional population-based survey in Japan revealed that only 30%

of participants utilised the internet to acquire health-related information (Takahashi et al., 2011). Furthermore, in the study conducted by Suka et al. (2015), only 60% of Japanese respondents had sufficient access to health information and utilised three or more sources when seeking health information; these sources included: hospitals, pharmacies, healthcare facilities, family and friends, books and magazines, and the internet. There is, however, currently no research surrounding access to online health information for patients who experience tinnitus.

The internet has swiftly expanded to "address the demand for medical information on health-related topics, and health information is widely prevalent and often sought on the internet" (Cotten & Gupta, 2004, p. 1796-1797). At present, there are more than 70, 000 websites aimed at providing health information online (Cline, 2001). The growth of online health information consumption can be explained by multiple factors. This includes the sheer volume and diversity of online information outweighing that of offline options (Dobransky & Hargittai, 2012), the development of interactive or consumer-orientated health care models, and the speed in which health information continues to outgrow the pace at which clinicians can keep up with (Cline, 2001). This is followed up by cost-containment efforts, reducing appointment times where patients can raise concerns about how they can go about accessing best care, the importance placed upon self-care and prevention, alongside an aging population with increased healthcare needs, and greater interest surrounding alternative approaches to health care (Cline, 2001). The internet also provides a platform for individuals who share similar health concerns and conditions to exchange information and provide support for one another, regardless of background and location (Dobransky & Hargittai, 2012).

Consumers often refer to the internet to increase their understanding of health issues and to get health information related to diagnosis, treatment options, health specialists, and wellbeing before undertaking a health change. This fact is supported by a study conducted by Cotten and Gupta (2004), where 93% of subjects sought specific health information surrounding specific health conditions and 55% gathered information before attending a healthcare appointment. As a result, the act of pursuing health information online may estrange relationships between patients and healthcare professionals where patients have expressed dissatisfaction with health-care providers, leading them to trust more in favour of online health information (Mano, 2014). Jamal et al. (2015) argue that despite increasing patient autonomy with the emergence of the internet, health professionals remain as one of the most preferred sources of health information despite new media, suggesting that more healthcare providers need to "explore the internet as a viable medium for communicating with their patients" (Dutta-Bergman, 2003, p. 21).

1.9. Readability

Readability is defined as the ease with which readers can understand a piece of text (Singh, 2003). The readability of a text is usually expressed as a RGL (Kim et al., 2007). RGLs correspond to an equivalent US grade level and can be interpreted as the number of years of education required to read and understand written material (Kim et al., 2007). Health information provision is a fundamental responsibility of health education with health literacy being a principal outcome. This means that the dissemination and production of health information beyond the reading and literacy skills of its designated demographic, such as patients or caretakers, is impractical and inefficacious (Cheng & Dunn, 2016).

Groups such as the National Work Group on Cancer and Health and the American Medical Center Cancer Research Group recommend that health information should not exceed reading levels beyond sixth grade level (Polishchuk et al., 2012). By standardising lower reading grade levels for medical literature, a larger portion of the patient population (and their subsequent caretakers) should, in theory, be able to understand the health information that is provided to them (Polishchuk et al., 2012). This is because readability is an important determinant of an individual's ability to comprehend health information (Sabharwal et al., 2008). This, in turn, promotes the creation and dissemination of patient-centred educational materials. Polishchuk et al. (2012) found that only 2% of articles were written at sixth grade level or below and 18% were written at eighth grade reading level or below, which corresponds to the average literacy level held by adults in the US.

Studies indicate that health professionals often integrate jargon when engaging with laypersons, and produce health information with RGLs beyond the capacity of their intended audience (Okuhara et al., 2017). Complex health information is a barrier to accessing health information for those with poor literacy skills, which exacerbates adverse health outcomes and health inequalities (Mcinnes & Haglund, 2011). Some patients are unaware of their low literacy skills and often overestimate their abilities (Cornett, 2009). According to Cornett (2009), patients who read at lower levels structure their lives according to what they can read while compensating for their health condition using many coping strategies. In a study of low-literate patients, 67% of participants had never disclosed their low level of literacy to their spouse (Parikh et al., 1996). In contrast, more than half had never told their children, and one in five reported never telling anyone (Parikh et al., 1996). Parikh et al. (1996) also outlined that 66-75% of adults categorised in the lowest literacy level described

themselves as being able to read *well* or *very well*. This highlights why patient literacy level is crucial to healthcare outcomes.

A small body of research suggests that appropriate RGLs can be acquired by decreasing sentence length and using simpler words (Singh, 2003). Cheng and Dunn (2016) state that although RGLs play a particular role in a patient's understanding of health information, factors such as information comprehension in conjunction with the readers' experience, reading environment, and presentation format contribute to the readability of a text. This means that a patient reading at an eighth grade level may recognise all the words presented in a medical brochure written at this level but may struggle to understand the content because of how it is written (Singh, 2003).

The US Department of Education, National Institute of Literacy, reported that more than 32 million American adults could not read and 68 million lack the literacy skills at fifth grade level (Daraz et al., 2018). There is currently minimal research surrounding readability within the Japanese health sector, and no consensus concerning literacy levels in the Japanese language (Sakai, 2013). A study conducted by Nakayama et al. (2015) showed that health literacy in Japan was lower than that of their European counterpart. This was possibly due to the lack of a comprehensive website for reliable health information comparable to MedlinePlus (US National Library of Medicine) and the inefficiency of the Japanese primary health-care system, which lacks general practitioners as gatekeepers (Nakayama et al., 2015). A pilot study conducted by Ishikawa et al. (2018) found that the mean score of baseline health literacy was 3.67 which was slightly higher than that of a previous nationwide online survey of the general Japanese population. In another study aimed at comparing readability of pro-cancer and anti-cancer screening online messages in Japan, researchers found that anti-cancer screening online messages were generally

easier to read than pro-cancer screening online messages, and messages written by health professionals were more difficult to read than those written by non-health professionals. (Okuhara et al., 2017)

1.10. Readability of Japanese

1.10.1. Readability Formulas

Readability formulas are designed to estimate the difficulty of understanding a piece of text (Si & Callan, 2001). They typically involve measurable components such as the average number of syllables per word (Si & Callan, 2001), word length, and sentence length (Lenzner, 2013). The weighted combination of these aspects generates a score that is representative of the text's relative difficulty or the necessary grade level of education required to understand it (Lenzner, 2013). The Japanese term for readability is expressed as 読みやすさ (yo-mi-ya-su-sa) or リーダビリティ (rii-da-bi-ri-tei). There are currently few readability measures proposed for Japanese texts, none of which is widely used (Satoshi et al., 2008). Some of the readability formulas used for Japanese texts include Tateisi et al. (1988a), Obi2, and jReadability. These formulas estimate readability based on the number of words per sentence and the proportion of verbs in the overall text.

The readability formulas proposed by Tateisi et al. (1988a) and Tateisi et al. (1988b, as cited in Satoshi et al., 2008) implement several factors; the latter utilising ten factors and the former (which is the simplified version) utilising six factors. These six factors include the average number of characters per sentence, the average number of Roman letters and symbols per run, the average number of *hiragana* characters per run, the average number of *kanji* characters per run, the average number of *katakana* characters per run, and the ratio of *touten* (comma) to *kuten* (period),

where run denotes an uninterrupted string of the same type of character (Satoshi et al., 2008). This readability formula has been used in linguistic studies such as that by Hayashi (1992), which aimed at proposing a three-level revision model for improving poorly-styled Japanese expressions. The formula, however, remains largely unfamiliar to the public and no software tools are currently available.

To assess the readability of online health information in Japanese, the Japanese text readability measurement system, jReadability, was implemented for this study. The jReadability system was selected as it "is the most authentic validated measure of Japanese readability" (Okuhara et al., 2016, p. 5238) and was used in Alexander's study (2018) assessing hearing-related information in the Japanese language. jReadability utilises a readability formula which involves indices such as the mean length of a sentence, the proportion of *kango* (words of Chinese origin), the proportion of *wago* (words of Japanese origin), the proportion of verbs, proportion of auxiliary verbs, and the proportion of particles (suffixes following a modified noun, verb, adjective, or sentence) with respect to the overall text (Hasebe & Lee, 2015). The indices are highlighted in Table 1. The results are then entered into a computer system which calculates a readability score and an estimated reading level, as highlighted in Table 2, via a web-based online interface. This system relies on a collection of sentences being used and is designed to estimate the readability level of passages consisting of 500 - 1000 characters. jReadability was designed to help facilitate learning the Japanese language by non-native speakers. jReadability has been used in a few published studies, such as in a randomised controlled study by Okuhara et al. (2020), which investigated the relationship between high versus low readability of written health information on self-efficacy.

In contrast, existing readability formulas such as those produced by Shibasaki and Hara (2010, as cited in Hasebe & Lee, 2015) are designed to be used by native readers of Japanese. The readability formula was derived from a six levelled corpora, primarily consisting of texts from Japanese textbooks, and was tested against "another set of levelled texts in Japanese to prove its reliability" (Hasebe et al., 2019, p. 144). The readability formula implements a linear regression analysis to produce one of six different readability levels which the user can then interpret. For the purpose of this study, the Upper-intermediate level was used as the maximum threshold for suitable readability as this approximately translates to sixth grade reading level, which is recommended when producing and disseminating health information. Because there are no Japanese guidelines surrounding what RGL is equivalent to each readability level, the guidelines for English is only an estimate, as highlighted in Table 2: Lower-elementary as first grade reading level, Upper-elementary as first – second grade reading level, Lower-intermediate as third – fourth grade reading level, Upper-intermediate as sixth grade reading level, Lower-advanced as eight grade reading level, and Upper-advanced as tenth – twelfth grade reading level.

Table 1: jReadability Formula

Component	Value
Constant	11.724
Mean sentence length	-0.056
Percentage of *kango*	-0.126
Percentage of *wago*	-0.042
Percentage of verbs	-0.145
Percentage of particles	-0.044

Table 2: jReadability Values: Quality of online health information

Level	Readability score range
Upper-advanced	0.5 - 1.4
Lower-advanced	1.5 - 2.4
Upper-intermediate	2.5 - 3.4
Lower-intermediate	3.5 - 4.4
Upper-elementary	4.5 - 5.4
Lower-elementary	5.5 - 6.4

1.11.1. HONcode

When searching for health information online, laypersons and professionals alike have difficulty determining the quality, accuracy, and reliability of webpages (Boyer et al., 2017; Kusec et al., 2003). Studies show that the quality of health information found on the internet is highly inconsistent (Boyer & Dolamic, 2015). The Health on Net Foundation Code of Conduct (HONcode) for medical and health websites addresses one of the primary healthcare challenges faced on the internet: the reliability and credibility of online information (Kusec et al., 2003).

The HON Foundation is a non-profit organisation, internationally renowned within the field of health information ethics for creating its code of ethical conduct, also known as the HONcode (HONcode, 2017). The HON Foundation was established to foster the dissemination of high-quality health information for patients, professionals, and the general public while also facilitating access to current and relevant medical data when using the internet (HONcode, 2017). The HONcode is designed to achieve two things: (1) to help consolidate and standardise the quality of medical literature and health information found on the internet, (2) to identify websites that are reliable and maintained by qualified people (Boyer et al., 1998). One indicator of website quality, recognised by non-health professionals, is HONcode

approval. Websites that display the HONcode seal are four times more likely to appear on an accurate website than a less accurate website (Kusec et al., 2003). The HONcode is a code of ethics that strives to demonstrate the intention of a website to publish quality medical information that is objective, transparent, and tailored to meet their audience's needs (HONcode, 2017). For a website to gain HON certification, it must follow eight of the code's procedural principles outlined on the HON website. The HONcode principles are outlined in Table 3.

Table 3: The HONcode Principles

Principle 1	**Authority** Give qualifications of authors
Principle 2	**Complementarity** Information to support, not replace
Principle 3	**Confidentiality** Respect the privacy of site users
Principle 4	**Attribution** Cite the sources and dates of medical information
Principle 5	**Justifiability** Justification of claims / balanced and objective claims
Principle 6	**Transparency** Accessibility, provide valid contact details
Principle 7	**Financial disclosure** Provide details of funding
Principle 8	**Advertising** Clearly distinguish advertising from editorial content

1.12. Aims and Hypotheses

The purpose of this study is to examine the readability and quality of tinnitus-related information that Japanese speakers are likely to find when searching for tinnitus information on the internet. The study is categorised into two parts. Part 1 assesses the readability of this information using the Japanese Text Readability Measurement System "jReadability" (http://jReadability.net). Part 2 assesses the

quality of this information using the HONcode certification. Specific hypotheses are detailed below.

1.12.1. Internet Search

1. There is an even distribution in the type of organisation (government/non-profit and commercial) found using the search criteria. This hypothesis is expected to be supported.

2. There is an even distribution in the locality of the webpages found using the search criteria. This hypothesis is expected to be supported.

3. There is an even distribution of type of organisation by locality. This hypothesis is expected to be supported.

1.12.2. First Aim: Readability

4. Webpages found using the criteria will not have a mean RGL greater than 6. This hypothesis is expected to be not supported. It is expected that the mean RGL will be greater than 6 because this is consistent with the findings established by Alexander (2018).

5. There is no significant difference in mean RGL between webpages based on locality. This hypothesis is expected to be supported because this is consistent with the findings established by Alexander (2018).

6. There is no significant difference in mean RGL between webpages based on type of organisation. This hypothesis is expected to not be supported because this is consistent with the findings established by Alexander (2018).

1.12.3. Second Aim: Quality

7. There is an even distribution of HON certification by locality. This hypothesis is expected to be supported.

8. There is an even distribution of HON certification by type of organisation. This hypothesis is expected to be supported.

Chapter 2: Methods

2.1. Overview

This study investigated the readability and quality of online health information related to tinnitus in Japanese. The methodology for the study followed on from Alexander's study (2018) and was categorised into two parts. Search terms were established by Japanese speakers when searching for information related to tinnitus on the internet. Webpages were identified and recorded by taking the top 10 search results from Google Japan and Yahoo! Japan, differentiated by Japan's country-code Top-Level Domain (ccTLD), using the search terms. Part 1 consists of assessing the readability of Japanese webpages using the jReadability system. Part 2 aims to assess the quality of the information presented on these webpages by using the presence of the HONcode as an indicator of quality.

2.2. Finding Webpages

2.2.1. Participants

Participants were recruited using two sampling methods: convenience sampling and snowball sampling, and were asked to complete an anonymous, online survey as approved by The Human Ethics Committee at the University of Canterbury on the 5th of April, 2020 (Approval, participant information sheet and consent form at Appendix A). Individuals were selected based on three criteria: they must be over 18 years of age, they must be native speakers of Japanese, and they must be able to read in English. Eligible participants were then asked to produce Japanese search terms according to the following question, "In Japanese, please list what words you think

people interested in learning about ‘a ringing/buzzing sensation in their ears’ might use when searching online in Japanese. List as many words you can think of.”

2.2.2. Identifying Search Terms

The survey went live on the 5th of May, 2020 and continued until saturation was reached on the 27th of July 2020 (i.e., when two consecutive participants were unable to produce new search terms). From the survey, 40 unique search terms were generated, five of which were selected for the purpose of this study after being identified by two or more participants. The search terms were as follows: 耳鳴り (tinnitus), 耳がピー (ringing in the ear), 耳がキーン (buzzing in the ear), 耳の奥で音がする (sound in the ear), and 耳変な音 (weird sound in the ear).

2.2.3. Identifying ccTLDs

The five search terms were entered into Google Japan and Yahoo! Japan on the 3rd of October 2020. According to StatCounter (2021), Google owns more than 74% of the search engine market share in Japan, followed by Yahoo! at 20.78% and Bing at 4.61%. A ccTLD consists of two letters and denotes a specific country or geographic area (Zelek, 2014). The ccTLDs used in this study were google.co.jp (Google Japan) and yahoo.co.jp (Yahoo! Japan), respectively.

2.2.4. Inclusion and Exclusion Criteria

The first ten webpages from each search were recorded and used for this study if they met all the following criteria: (1) primarily written in Japanese, (2) contain information relating to tinnitus, (3) freely available to the public, and (4) contain information about the organisation hosting the webpage. Webpages were excluded from this study if they were: (1) a search-engine-identified advertisement, (2) a video, (3) a directory listing, or (4) less than 500 characters in length. Duplicate webpages were removed, which left 23 unique webpages in the final collection.

2.2.5. Webpage Information

When seeking health information online, internet users are much more likely to access the first page of search engine results, with a rapid decline thereafter (Hansen et al., 2003; Laurent & Vickers, 2009). Several studies also indicate that consumers often rely upon popular search engines such as Google (Kitchens et al., 2014; Laurent & Vickers, 2009) and Yahoo! (Cooper et al., 2005; Wang et al., 2012) when searching for and appraising health information online (Hansen et al., 2003). For these reasons, the first ten webpages produced by Google Japan and Yahoo! Japan were recorded for this study. Webpage information and results were recorded using an Excel spreadsheet. The URL of each webpage, along with the type of organisation, the location of the webpage host, and the presence or absence of HONcode certification, were also recorded. The type of organisation was categorised as either non-profit or commercial. Webpages were classified as non-profit if they were hosted by non-profit organisations such as government agencies. All other webpages, such as those containing advertisements, were classified as commercial. The organisation hosting the webpage was obtained from the webpage itself or by conducting further internet searches when this information was made unavailable. The location of the organisation hosting the webpage was determined according to the webpage's URL or found directly on the website. Organisations targeted at a global audience (e.g., Wikipedia) were classified as *World*. All other remaining webpages were classified as *Japan*. Webpages were accessed directly from the search engine results; links embedded in the content of these webpages (such as those linked to external sources or other pages within the same website) were not explored. The content of each webpage was copied and pasted and individually stored into separate Word documents for analysis.

2.3. Part 1: Readability Analyses

Part 1 of this study assessed the readability of the 23 webpages identified. The Japanese Text Readability Measurement System, jReadability, was used to appraise this according to the jReadability formula: (https://jreadability.net/en/). The content of each webpage was copied and pasted as paragraphs of plain text into separate Word documents. These files were then cleaned (e.g., images removed, organised into paragraphs) before being pasted into the online jReadability system until approximately 900 - 1000 characters were attained for each sample webpage. Hasebe et al. (2019) recommend using input texts that are roughly 500 - 1000 characters in length, composed of multiple sentences, to yield reliable results. The readability level generated by the software and relevant website information were recorded in an Excel spreadsheet. Because equivalent RGLs were not assigned, rough estimations were made according to their corresponding Japanese-Language Proficiency Test (often referred to as JLPT) levels.

RGLs were strictly used for discussion purposes and were not included in the statistical analysis. Instead, jReadability levels were measured as raw numerical values (consisting of two-three significant figures) and used to improve statistical accuracy.

2.4. Part 2: Quality

Part 2 of this study assessed the quality of these webpages. The presence or absence of HONcode certification was implemented to appraise quality. Prior to conducting the web searches, HONcode certification was determined by downloading the Google Chrome HONcode Toolbar extension and verifying its presence (or

absence) on each webpage. The HONcode Toolbar extension identifies websites with HONcode certification on major search engines such as Google and Yahoo!.

2.5. Statistical Analyses

IBM SPSS statistics software version 23 was used to perform statistical analysis. Descriptive statistics were implemented to acquire minimum and maximum scores, median values, and information surrounding skewness and kurtosis related to readability levels. The presence or absence of significant outliers was confirmed through the use of box plots. Chi-Square tests were used to assess the distributions in the locations and types of organisation hosting the webpages found using the search criteria, and the type of organisation according to locality. Non-parametric testing was used as readability levels were based on ordinal measurements and small sample sizes were obtained. Descriptive statistics were utilised to identify if any webpage possessed a readability level higher than the Upper-intermediate jReadability level, in conjunction with a one-sample Wilcoxon signed rank test to identify whether the mean readability level of these webpages was significantly greater than the Upper-intermediate jReadability level. The Mann-Whitney U test was used to test for significant differences in readability levels based on the location and type of organisation hosting the webpages.

Chapter 3: Results

3.1. Overview

The internet search yielded 100 webpages (5 search terms x first ten results x 2 browsers (Google Japan and Yahoo! Japan)), 23 of which were included in this study once duplicates were removed, and the inclusion/exclusion criteria were applied. Table 3 shows the number of webpages found for each organisation type according to location. Table 4 shows the final number of webpages used in this study (all URLs are available in Appendix B). Statistical analysis showed that kurtosis distribution was within normal limits, and no significant outliers were identified.

Table 4: Number of webpages according to organisation type

Location	Organisation Type	Number (N)
Japan	Commercial	14
	Non-Profit	4
	Total	18
World	Commercial	4
	Non-Profit	1
	Total	5
Total		23

3.2. Origin of Webpages

Hypothesis 1, "*There is an even distribution in the type of organisation (non-profit/government and commercial) found using the search criteria*" was not supported. A Chi-Square Goodness-of-Fit test revealed that the distribution was not significantly even ($\chi 2$ (1, N = 23) = 7.348, p = .007).

Hypothesis 2, "*There is an even distribution in the locality of the webpages found using the search criteria*" was also not supported. A Chi-Square Goodness-of-Fit test determined that the locality of webpages was not evenly distributed within the population (χ^2 (1, N = 23) = 7.348, p = .007).

Hypothesis 3, "*There is an even distribution of type of organisation by locality*" was supported. A Chi-Square Test of Independence revealed that the distribution of organisation type according to locality was not significantly uneven ($\chi 2$ (1, N = 23) = .012, p = .915).

3.3. Part 1: Readability

Readability was analysed using the jReadability formula. Descriptive statistics were not used to test for normality as non-parametric testing was used; however, descriptive statistics revealed that there were no significant outliers in the readability levels.

Hypothesis 4, "*Webpages found using the criteria will not have a mean RGL greater than 6"* was addressed using a non-parametric one-sample test. A one-sample Wilcoxon signed rank test revealed that the mean jReadability level (RGL) is significantly greater than the Upper-intermediate level, T = 15, z = -2.98 p = 0.003.

The descriptive statistics for the jReadability formula (measured as raw numerical values) is shown in Table 5. Therefore, the null hypothesis was not supported.

Table 5: Descriptive statistics for jReadability formula

Readability Formula	N	Min.	Max.	Mean.	SD
jReadability	23	1.33	3.70	2.48	0.62

Note. N - number

Min. - minimum score

Max. - maximum score

SD - standard deviation

Hypothesis 5, "*There is no significant difference in mean RGL between webpages based on locality*" was supported. A Mann-Whitney U test revealed no significant differences in readability levels according to the locality of the webpage, (U = 33, z = -.894, p = .371, r = .19, r^2 = 0.035, two-tailed). Readability levels obtained from webpages based in Japan (*Min* = 1.33, *Max* = 3.70, *Mdn* = 2.45, N = 18) were not significantly higher than readability levels obtained from webpages targeted at a global audience (*Min* = 1.96, *Max* = 3.08, *Mdn* = 2.84, N = 5).

Hypothesis 6, "*There is no significant difference in mean RGL between webpages based on type of organisation*" was supported. A Mann-Whitney U test revealed no significant differences in readability levels according to the type of organisation, (U = 27, z = -1.342, p = .180, r = 0.2798, r^2 = 0.078, two-tailed). Readability levels obtained from webpages categorised as commercial (*Min* = 1.33, *Max* = 3.70, *Mdn* = 2.48, N = 18) were not significantly higher than readability levels obtained from webpages categorised as non-profit (*Min* = 1.84, *Max* = 2.75, *Mdn* = 2.31, N = 5).

3.4. Part 2: Quality

Hypothesis 7, "*There is an even distribution of HON certification by locality*" and **hypothesis 8**, "*There is an even distribution of HON certification by type of organisation*" could not be tested because only one website found in this study held HONcode certification. Furthermore, no additional findings related to the distribution of authors found using the search criteria could be tested because all the websites found in this study had professional authors.

Chapter 4: Discussion

4.1. Overview

The aim of the study was to assess the readability and quality of online tinnitus information written in the Japanese language. Google Japan and Yahoo! Japan were used to retrieve 23 unique webpages for five search terms: 耳鳴り (tinnitus), 耳がピー (ringing in the ear), 耳がキーン (buzzing in the ear), 耳の奥で音がする (sound inside the ear), 耳変な音 (weird sound in ear). This chapter discusses the results presented in Chapter 3 in relation to the literature discussed in Chapter 1.

4.2. Part 1: Readability

Part 1 of this study estimated the readability of online tinnitus information in Japanese by calculating the readability scores of the webpages found using the search criteria. The results of this study indicate that the vast majority of online tinnitus-related information in Japanese is written at significantly higher readability levels than what is recommended. This indicates that most of this information is inaccessible to the average reader.

The mean readability score of the webpages analysed in this study, as calculated by the jReadability formula, was 2.48, or Lower-advanced level (equivalent to a RGL of eighth grade). This is significantly higher than the recommended Upper-intermediate level (equivalent to a RGL of sixth grade) and suggests that readers require eight years of education to read and understand the material. Of the 23 webpages used for this study, only two webpages held a RGL below the sixth grade

level, indicating that only two webpages held a readability score below the recommended difficulty.

This is the first published study since Alexander (2018) to assess the readability of online tinnitus information in the Japanese language. The mean readability score (and its equivalent RGL) found in the present study was lower than what was reported in other studies aimed at assessing the readability of tinnitus-related information in Spanish and English (Greer, 2019; Manchaiah et al., 2019). Even lower readability scores, however, were found in studies assessing online health information in the Japanese language. For example, in a study conducted by Okuhara et al. (2016), anti- and pro-cancer screening online messages were assessed using the jReadability formula. The results of this study revealed a mean readability score of 2.7 (SD = 0.52) or Upper-intermediate level (sixth grade reading level). Similar findings were also reported by Okuhara et al. (2017) when assessing anti- and pro-influenza vaccination online messages in Japanese. The results of this study revealed a mean readability score of 2.93 (SD = 0.55) or Upper-intermediate level (equivalent to sixth grade reading level) as assessed by the jReadability formula. Although there are no published systematic literature reviews on the readability of tinnitus information found on the internet, several studies investigated the readability of tinnitus information online in English with mean readability levels ranging from tenth - twelfth grade (McKearney et al., 2018; Manchaiah et al., 2019).

Furthermore, in a systematic literature review of online hearing information in the English language (of which tinnitus was included in the search terms), Laplante-Lévesque and Thorén (2015) found mean readability levels ranging from 9 to over 14. In general, it seems that studies examining online health information in Japanese reported lower mean readability levels than of those in the English language.

Discrepancies found between these results may suggest that Japanese information is typically easier to read and understand than information in English. This, however, may also be due to discrepancies found between the readability formulas used. The results of this study suggest that tinnitus-related information in Japanese, along with other health information, is generally difficult to read and has slightly worse readability in comparison to the recommended sixth grade reading level identified in the present study. Similar findings were also reported for health literacy. Nakayama et al. (2015) found that health literacy in the Japanese population was lower than in Europe.

4.2.1. Organisation Type

Webpages were categorised as commercial and non-profit (including all government entities). There was an uneven distribution in the type of webpages identified, with 18 webpages (78%) classified as commercial and 5 webpages (22%) classified as non-profit. These findings were surprising because the search term 耳鳴り (tinnitus) mainly generated webpages from hearing aid manufacturers and private ENT clinics instead of medical webpages of non-profit origin. This was also applicable to other search terms such as 耳がピー (ringing in the ear) and 耳がキーン (buzzing in the ear) which produced a significant proportion of webpages of commercial origin. Greer (2019) also found similar results when using similar search terms in the Spanish language, with 36 (82%) out of the 44 webpages reported to be of commercial origin and only 8 (18%) of non-profit origin (2 of which were governmental). In comparison to the Manchaiah et al. (2019) study, when used as an English search term along with other search terms such as “ringing in the ear” and “buzzing in the ear”, approximately 50% of the 134 webpages included for statistical

analysis were commercial while 44% were non-profit (5.2% of which were governmental).

Research suggests that readability plays a central role in determining a website's accessibility (Mcinnes & Haglund, 2011). Marketing health information in a way that is conceptually clear and specific allows marketers to identify the needs of their audience and to meet these needs (Bernhardt, 2006). Readability scores obtained from commercial webpages were not significantly higher than readability scores obtained from non-profit webpages. Similar findings were also reported by Greer (2019) and Manchaiah et al. (2019), where readability scores from commercial webpages were not significantly different from those of non-profit webpages. This is consistent with other research that corroborates that a significant portion of online health information is written at RGLs beyond what the average reader can comprehend (Laplante-Lévesque et al., 2012).

4.2.2. Webpage Locality

Webpages were also categorised according to their location, whether Japan or World. There was uneven distribution in webpage locality with a larger portion of Japanese webpages identified than webpages of World origin. Readability levels obtained from webpages of Japanese origin were not significantly different from those of World origin. At present, there are no published studies that compare the readability of health information in the English and Japanese language. These results are, however, consistent with other studies that assess the readability of hearing-related health information in English, Chinese, French, Spanish, and Japanese. Laplante-Lévesque et al. (2012) reported that the readability of hearing-related health information in the English language was generally difficult to read and above the recommended sixth grade reading level. Similar results were also found in traditional

Chinese (Hsu, 2017), French (Serban, 2018) Spanish (Greer, 2019), and for the Japanese language (Alexander, 2018). Furthermore, in a study conducted by Cardelle and Rodriguez (2005), the authors compared readability scores of US health websites with Spanish health websites. The results of this study revealed no significant differences in readability between US and Spanish websites. This suggests that hearing-related health information and general health information are written at high RGLs, regardless of origin. However, it is important to note that the sample size for World webpages was small, suggesting there was insufficient data to detect all but the biggest differences.

4.3. HONcode Certification

In the final sample of webpages included in this study, only one website was recognised as having this certification. As suggested by Alexander (2018), this may be due to a lack of awareness. In a systematic review conducted by Laplante-Lévesque et al. (2012), 66 websites associated with hearing-related information in the English language were examined. Only nine (14%) websites had obtained HON certification with over half (60%) being of government origin. Similar findings of low HON certification penetration were reported by Manchaiah et al. (2019). Only 18 out of the 134 websites (13.5%) included in that study carried HONcode certification, with websites of government origin more likely to possess HONcode certification than all other origins. A comparative study conducted by Tanabe et al. (2018) also found comparable findings with the majority of US websites possessing marks "indicating certification of compliance guarantees by third parties, represented by the Health on the Net (HON) Foundation" (p. e7) while none of the Japanese websites possessed such marks. Based on the low penetration rate of HONcode certification

across the studies mentioned above, the value that HONcode certification gives in helping online consumers ascertain high quality health information from low-quality health information on the internet in Japan remains ambiguous.

4.4. Study Limitations

One of the limitations of this study was the way in which search terms were identified. As mentioned in Chapter 2, native Japanese speakers were recruited to emulate the target population's search strategy; however, the search strategy used in the present study may differ from the search strategy used by Japanese-speaking adults when seeking tinnitus information online. For example, webpages were only acquired through Google Japan and Yahoo! Japan, using five key search terms to analyse the first ten search results. A qualitative study conducted by Eysenbach and Köhler (2002) suggests that consumers do not limit themselves to a single search term when searching for and appraising information online. They also do not systemically review results as presumed by previous studies aimed at evaluating the quality of information found on the internet. This limitation suggests that the information found using the search criteria may not be an accurate representation of what native Japanese speakers actually come across when searching for tinnitus-related information on the internet.

Furthermore, as information on the internet continues to evolve, the webpages analysed in this study only provide a snapshot of the literature available online in Japanese on tinnitus on May 5, 2020. As a result, replicating the same search may produce a slightly different sample of webpages.

The present study did not, however, assess the understanding of real consumers searching for tinnitus-related information online. In lieu of comprehension, readability

was measured using the jReadability formula. Despite its high validity in measuring Japanese readability (Okuhara et al., 2016), employing different formulas would provide a wider range of potentially more accurate results. For this reason, it may be valuable for future research to implement a broader range of readability formulas and test the comprehension of real participants.

Another limitation that requires comment was the use of non-parametric testing. Non-parametric testing was required for the following reasons: because the majority of webpages were of commercial and Japanese origin, webpages of non-profit (including governmental) origin generated a much smaller sample pool. Statistical analyses were also based on non-parametric measurements as RGLs were based on ordinal measurements. Sullivan and Feinn (2012) describe effect size as the difference between groups, and as the main finding of a quantitative study. Although several hypotheses did not result in significant findings, some of the reported effect sizes were small (such as in the case for $H_0$5 which assessed the relationship between RGL and webpage locality, reporting an effect size of r = .19). This loss of statistical power is most likely not entirely due to the use of non-parametric testing and the small sample size. This is also applicable to the non-significant findings (such as in cases for $H_0$3 and $H_0$6). If larger sample sizes coupled with parametric testing were obtained, this could increase the chance of significant findings found when carrying out hypothesis testing and statistical analysis.

4.4.1. jReadability Formula Limitations

Readability formulas are being increasingly used to measure the understandability of written information in clinical and medical settings (Ley & Florio, 1996); however, they often lack strong construct validity (Crossley et al., 2017) and have been criticised for being poor predictors of text comprehensibility (Crossley et al., 2008).

This is because readability formulas rely on statistical correlations (Crossley et al., 2017) to predict the level of reading ability required to read a piece of text (Crossley et al., 2019). Furthermore, several linguistic factors determine text comprehension, only two (lexical and syntactic) of which are used by readability formulas (Crossley et al., 2017).

In the case of the jReadability formula, pieces of texts are categorised into six levels of difficulty based on Japanese language textbooks. Hasebe et al. (2019) highlight several limitations attached to this formula. Depending on the nature of the input text, the online system may not accurately parse the text and separate it into individual words (Hasebe et al., 2019). This means that the readability levels produced may be skewed so that the text seems more difficult than it truly is. Another limitation is how the jReadability formula scores pieces of texts. Texts scored as a 0.5 are considered the most difficult to read while texts that receive a 6.5 are the easiest to read. This system utilises a conflicting numerical scale to that of RGLs commonly used when assessing readability such as the Flesch Reading Ease and Flesch-Kincaid grade level (Williamson & Martin, 2010). This makes it much more difficult to draw comparisons across languages and relevant studies. When converting readability scores calculated by the jReadability formula into their equivalent Flesch-Kincaid grade level, the limitations of this system are evident. For example, readability scores of Upper-intermediate difficulty were converted into sixth grade reading level while Lower-advanced were converted into eighth grade level. Because jReadability levels are based on Japanese-Language Proficiency Test levels and are given as a numerical range, the formula fails to provide a clear distinction between texts equivalent to seventh grade reading level from sixth grade reading level and eighth grade level. This conspicuous gap between readability levels is also seen between texts of Lower-

advanced difficulty (equivalent to eighth grade reading level) and Upper-advanced difficulty (equivalent to tenth – twelfth grade reading level). Instead, approximate ranges are provided in which the mean is used to represent the overall readability level. This limitation suggests that the present study results may be skewed. Lower RGLs may have been assigned to texts with worse readabilities, which in turn suggests that the statistical analyses provided in Chapter 3 may also be skewed and less accurate. Because of this, future research may wish to develop a mainstream Japanese readability formula that offers equivalent conversions into RGLs, allowing for easier cross-comparisons between studies and languages (Alexander, 2018).

4.5. Clinical Implications

Tinnitus is a prevalent health symptom (Tunkel et al., 2014) associated with serious psychosocial consequences (Falkenberg & Wie, 2012; Ferreira et al., 2009; Langguth et al., 2013). However, with appropriate management, the impacts of tinnitus and its effects on quality of life may be reduced (Savage & Waddell, 2014). Patients with tinnitus and their communication partners (such as family members) require both accessible and comprehensive information for two reasons: to improve health literacy and to make empowered and informed decisions regarding their health and available management options.

As discussed in previous sections, health information that is difficult to read or low in quality prevents consumers from fully understanding what they are reading. As a result, healthcare professionals and marketers must be aware of the nature of the information their patients have access to on the internet and the complexity of this information in relation to their patient's health literacy skills. Lambert et al. (2014)

state that patients who have high health literacy demands placed upon them not only have low health literacy knowledge and skills but if not supported in their encounters with healthcare professionals, will lack the opportunities needed to develop their health literacy skills leading to adverse health outcomes. An increase in awareness amongst healthcare professionals of the readability and quality of health information online has shown to increase patient health literacy from engaging with both written and human information sources (Edwards et al., 2012). Awareness alone, however, does not tackle existing health literacy issues in their entirety. Health information must be written at suitable reading levels, such as the recommended sixth grade level.

When used correctly, the internet can be an effective tool for many consumers: it can ameliorate or further support information discussed during consultations, and increase access to health and tinnitus-related information as a first-point of healthcare information, especially for those who may not or cannot visit a healthcare professional. However, an increase in internet use when seeking health information may prove problematic in light of the present study's results—compounded with existing health literacy, readability and quality issues, current health information available online may lack accessibility and efficacy in terms of comprehension for the average reader.

The results of this study revealed that at present, there is an apparent shortage in the pool of tinnitus-related information made available in the Japanese language that is both accessible and quality-assured on the internet. It is crucial that there is good quality healthcare and medical-related material for patients with low health literacy so they can access and understand their medical needs (Marquez & Ladd, 2019). Because of this, medical and healthcare information should be written at sixth grade reading level and revised for texts above ninth grade reading level (Dubay, 2004).

Because only one webpage held HONcode certification, future research may wish to employ other measurement tools such as DISCERN and SAM to assess tinnitus-related information quality.

4.6. Conclusion

The aim of this study was to assess the readability and quality of 23 tinnitus-related webpages in the Japanese language obtained from Google Japan and Yahoo! Japan. Using the jReadability formula to evaluate the readability of this information, results from the present study revealed that the mean RGL was significantly higher than the recommended sixth grade level. This is consistent with previous studies that have examined the readability of other health-related information in English and Spanish, suggesting that the webpages assessed in this study are most likely too difficult to read for the average reader. Quality could not be assessed due to insufficient sample size of HONcode certified webpages.

As the internet continues to evolve, it is becoming an increasingly popular source of health information but the quality and readability of this information is questionable, with low quality, difficult-to-read information that limits patient comprehension. Given that more than 127 million people speak Japanese globally, coupled with the worldwide prevalence of tinnitus in adults (10 - 15%) and elderly populations (30 - 35%), it is crucial that native Japanese speakers have access to quality, easy-to-read information online. However, results from this study indicate otherwise. From a clinical perspective, audiologists and medical professionals must be aware of their patients' health literacy deficiencies, especially when recommending or supplying tinnitus information to them. For patients who utilise the internet to

determine the health decisions they make concerning their hearing, such as tinnitus, the standard of the information they come across demands investigation.

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Appendix A: Human Ethics Approval, participant information sheet, and consent form

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UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson
Telephone: +64 03 369 4588, Extn 94588
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2019/07/LR Amendment 2

14 February 2020

Rebecca Kelly
Psychology, Speech and Hearing
UNIVERSITY OF CANTERBURY

Dear Rebecca

Thank you for your request for an amendment to your research proposal "Quality of Hearing-Related Internet Information" as outlined in your email dated 10th February 2020.

I am pleased to advise that this request has been considered and approved by the Human Ethics Committee.

Yours sincerely

Dr Dean Sutherland
Chair, Human Ethics Committee

School of Psychology, Speech and Hearing | Te Kura Mahi ā-Hirikapo
Telephone: 03 369 4519
Email: cdk25@uclive.ac.nz
Date: 05/05/2020
HEC Ref: 2019/07/LR

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

How Easy is it to Read Tinnitus-Related Webpages in Japanese?
Information Sheet for participants

My name is Chantelle Kim. I am a second year, Master of Audiology student at the University of Canterbury. I am conducting a research study that aims to assess the readability of webpages containing tinnitus-related information in the Japanese language.

Who is being sought?

Anyone who can read both Japanese and English are invited to participate in this research.

Am I compensated for my time?

No. There is no compensation for your involvement.

What do I need to do?

You will be asked to complete a short online questionnaire. It should take about 5 - 10 minutes of your time. The questionnaire will ask you to list terms you think people interested in learning about 'a ringing sensation in your ears' might use when searching online in Japanese. Please list as many words you can think of.

What else do I need to know?
Participation is voluntary and you have the right to withdraw or remove yourself from the survey and the research study at any stage without providing a reason or rationale. If you withdraw, all information relating to you will be removed unless data analysis has concluded. After data analysis has concluded, removal of individual data may not be practically achievable.

What happens to the study information or data?
A research thesis is a public document and will be available through the University of Canterbury Library. The results of the research project may be published in a peer-reviewed journal, but everyone taking part in the study may be assured of the confidentiality of all data gathered in this investigation. To ensure anonymity and confidentiality, data will be organized by a unique alpha-numeric code. All research information will be stored in password-protected electronic formats, in keypad locked, research labs at the University of Canterbury. Only the researcher, supervisor, and co-supervisors will have access. Data will be kept for a period of five years before it is destroyed, per University of Canterbury Human Ethics Committee and research protocols.

What if I want to know about how the research study turned out?
Tick the box on the online survey if you want to receive a summary of the results of the study.

Who is supervising the research study?
The research project is being carried out as a requirement for the Master of Audiology degree at the University of Canterbury. The primary supervisor of research study is Dr.

Rebecca Kelly-Campbell - rebecca.kelly@canterbury.ac.nz. In addition, the study is being co-supervised by Megan McAuliffe – megan.mcauliffe@canterbury.ac.nz.

Who approved this research study?
This project was reviewed and approved by the University of Canterbury Human Ethics Committee. Participants wishing to lodge a complaint should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

Please print or save this form for your records

THIS CONSENT FORM WILL BE HELD FOR A PERIOD OF FIVE YEARS

Study title: How Easy is it to Read Tinnitus-Related Webpages in Japanese?

The information about this research study has been explained to me to my satisfaction. I have had the chance to ask questions.

I know what I need to do to take part in the study.

I know that I can choose whether or not I take part in this research. I know that I may withdraw from the study without penalty by exiting the survey without submitting my answers.

I know that any information or opinions I give will be kept private to the researcher. I know that any published or reported results will not identify me.

I know that all data collected for the study will be kept in locked and secure facilities or in password protected computers and will be destroyed after ten years.

I will be given a copy of this form and the Research Information Sheet.

I know that I can contact the researcher for more information: {student name & email} or the primary supervisor, Dr Rebecca Kelly-Campbell: rebecca.kelly@canterbury.ac.nz, (03) 369 4519.

If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz, (03) 364 2987 ext 45588).

I know that if I would like a copy of the study results, I need to contact [Chantelle Kim at cdk25@uclive.ac.nz]

By clicking the continue button, I agree to take part in this research project.

Appendix B: List of Webpages

Number of webpages retrieved after matching against inclusion/exclusion criteria

Website	Location	Organisation Type	Jreadability	Estimated Equivalent RGL	HONcode Certified
https://www.resound.com/ja-jp/hearing-loss/tinnitus/tinnitus-articles-jp	World	Commercial	Upper Intermediate (3.08)	Grade 6	No
https://www.resound.com/ja-jp/hearing-loss/tinnitus/causes	World	Commercial	Upper Intermediate (3.02)	Grade 6	No
https://takeda-kenko.jp/navi/navi.php?key=miminari	Japan	Commercial	Upper Advanced (1.33)	Grade 10/12	No
https://www.chiba-city-med.or.jp/column/056.html	Japan	Commercial	Upper Advanced (1.49)	Grade 10/12	No
https://www.saiseikai.or.jp/medical/column/tinnitus/	Japan	Non-Profit	Lower Advanced (2.31)	Grade 8	No
https://www.healthcare.omron.co.jp/resource/column/life/48.html	World	Non-Profit	Lower Advanced (2.43)	Grade 8	No
https://www.msdmanuals.com/ja-jp/ホーム/19-耳、鼻、のどの病気/耳の病気の症状/耳鳴り	World	Commercial	Lower Advanced (1.96)	Grade 8	Yes
https://www.bee-lab.jp/yobouigaku/03/index.html	Japan	Non-Profit	Upper Intermediate (2.75)	Grade 6	No
https://www.toyota-mh.jp/kenkou/miminari.php	Japan	Commercial	Lower Advanced (2.47)	Grade 8	No
https://medicalnote.jp/symptoms/耳鳴り	Japan	Commercial	Lower Advanced (1.89)	Grade 8	No

http://www.ookita.com/cases/ear/393	Japan	Commercial	**Lower Advanced (2.46)**	Grade 8	No
https://epark.jp/medicalook/ear-ringing-cause/	Japan	Commercial	**Upper Intermediate (3.12)**	Grade 6	No
https://www.japa.org/tips/kkj_0103/	Japan	Non-Profit	**Lower Advanced (1.92)**	Grade 8	No
http://www.itaya.or.jp/?page_id=2	Japan	Commercial	**Upper Intermediate (2.62)**	Grade 6	No
https://fujimura-jibika.jp/disease_ear.html	Japan	Commercial	**Lower Advanced (2.44)**	Grade 8	No
https://www.tachibana-ent.jp/ear.html	Japan	Commercial	**Lower Advanced (2.48)**	Grade 8	No
http://www.hachinohe.aomori.med.or.jp/simin/befm/befm19.html	Japan	Non-Profit	**Lower Advanced (1.84)**	Grade 8	No
https://www.chugai-pharm.co.jp/ptn/medicine/karada/karada003.html	Japan	Commercial	**Lower Intermediate (3.64)**	Grade 3/4	No
https://inagaki-ent.com/ear/593/2019/06/19/593/	Japan	Commercial	**Upper Intermediate (2.99)**	Grade 6	No
https://sugimoto-clinic.or.jp/sinryounaiyou/tinnitus/	Japan	Commercial	**Lower Advanced (2.36)**	Grade 8	No
https://www.phonak.com/jp/ja/聞こえについて/耳鳴り.html	World	Commercial	**Upper Intermediate (2.84)**	Grade 6	No
http://onuki-jibika.com/ear.html	Japan	Commercial	**Lower Advanced (1.97)**	Grade 8	No
https://www.jiyugaokamp.com/menu/jibika_m.html	Japan	Commercial	**Lower Intermediate (3.7)**	Grade 3/4	No